

Claims:

1. An integrated process for the production of an alkenyl carboxylate which process comprises the steps:

- 5 (a) contacting in an oxidation reaction zone a C₂ to C₄ alkane, a molecular oxygen-containing gas, optionally the corresponding alkene and optionally water, in the presence of at least one catalyst active for the oxidation of the alkane to the corresponding alkene and carboxylic acid, to produce a first product stream comprising alkene, carboxylic acid and water;
- (b) separating at least a portion of the product stream from step (a) into a fraction comprising the alkene and a fraction comprising the carboxylic acid and water;
- 10 (c) contacting in a second reaction zone at least a portion of said alkene fraction produced in step (b), a carboxylic acid and a molecular oxygen-containing gas, in the presence of at least one catalyst active for the production of alkenyl carboxylate to produce a second product stream comprising alkenyl carboxylate, water and carboxylic acid;
- 15 (d) separating at least a portion of the product stream from step (c) and at least a portion of the carboxylic acid and water fraction produced in step (b) by azeotropic distillation into an overhead fraction comprising alkenyl carboxylate and a base fraction comprising carboxylic acid;
- 20 (e) recovering the alkenyl carboxylate from the overhead fraction separated in step (d).

2. A process according to claim 1 wherein the least a portion of the product stream from the second reaction zone is introduced separately from or as a single feed stream

with the at least a portion of the carboxylic acid/water fraction obtained in step (b) to the distillation column.

3. A process according to claim 1 or claim 2 wherein at least a portion of the product stream from the oxidation reaction zone is co-joined with at least a portion of the product stream from the second reaction zone and the co-joined stream fed into the distillation column.

4. A process according to claim 3 wherein the co-joined stream is fed as one or more streams into the distillation column.

5. A process according to claim 3 or claim 4 wherein at least a portion of the product stream from the oxidation reaction zone is fed to the distillation column separately from the product stream from the second reaction zone.

6. A process according to claim 5 wherein the product stream from the oxidation reaction zone is fed as one or more streams to the distillation column.

7. A process according to claim 5 or claim 6 wherein the product stream from the second reaction zone is fed as one or more streams to the distillation column.

8. A process according to any one of the preceding claims wherein the alkenyl carboxylate is vinyl acetate, the C₂ to C₄ alkane is ethane, the product stream from the oxidation reaction zone comprises ethylene, acetic acid and water, the carboxylic acid fed to the second reaction zone is acetic acid and the product stream from the second reaction zone comprises vinyl acetate, acetic acid and water.

9. A process according to claim 8 wherein ethylene and water are fed to the oxidation reaction zone.

10. A process according to any one of the preceding claims wherein the alkene fraction from the separation stage (b) is fed to the second reaction zone together with additional alkene.

11. A process according to claim 10 wherein the additional alkene is ethylene.

12. A process according to any one of the preceding claims wherein the weight ratio of water : carboxylic acid in the carboxylic acid/water fraction obtained in step (b) is in the range from 10 : 1 to 0.5 : 1.

13. A process according to any one of the preceding claims wherein the carboxylic acid fed to the second reaction zone has a water content, such that the amount of water entering the second reaction zone comprises less than 6 % by weight of the total

carboxylic acid and water entering the second reaction zone.

14. A process according to any one of the preceding claims wherein the catalyst in the oxidation reaction zone is supported or unsupported.

5 15. A process according to any one of the preceding claims wherein the catalyst in the oxidation reaction zone is used in the form of a fixed bed or a fluidized bed.

16. A process according to any one of the preceding claims wherein the concentration of alkene fed to the oxidation reaction zone is from 0 and up to and including 50 mol% of the total feed, including recycles.

10 17. A process according to any one of the preceding claims wherein the concentration of water fed to the oxidation reaction zone is from 0 and up to and including 50 mol% of the total feed, including recycles

18. A process according to any one of the preceding claims wherein the product stream from the second reaction zone is separated in one or more stages into a gaseous fraction comprising unreacted alkene and a liquid fraction comprising alkenyl
15 carboxylate, carboxylic acid and water.

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